

Appl. No. 10/594,784
Response Dated February 9, 2009
Reply to Office Action of October 10, 2008

• • REMARKS/ARGUMENTS • •

This preliminary amendment is being submitted together with a Request for Continued Examination (RCE).

By the present amendment, independent claim 1 has been changed to recite that the thiazole-based compound is an antioxidant that inhibits oxidative degradation of compression set characteristics of said acrylic elastomer composition.

Further new independent claim 14 has been added that is directed to a method of improving the compression set characteristics of an acrylic elastomer composition which involves incorporating a thiazole-based compound selected from 2-mercaptobenzothiazole, or its zinc salt, or dibenzothiazyl disulfide into the acrylic elastomer composition.

Claim 15 which depends from claim 14 recites that the thiazole-based compound inhibits oxidative degradation of compression set characteristics of said acrylic elastomer composition.

Claim 16 which depends from claim 14 recites that the elastomer composition further comprises including an amine-based or phenol-based antioxidant into the acrylic elastomer composition, which functions as a primary antioxidant.

Applicants' invention addresses a specific problem with acrylic elastomer compositions in which oxidative degradation deteriorates the compression set characteristics of the compositions.

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Applicants' solution, as claimed involves providing an acrylic elastomer composition which comprises a carboxyl group-containing acrylic elastomer, (A) a vulcanizing agent of polyvalent amine compound, and (B) an antioxidant comprising a thiazole-based compound selected from 2-mercaptobenzothiazole, or its zinc salt, or dibenzothiazyl disulfide

Claims 1-8, 10 and 12-15 are pending in this application.

Claims 1-4, 7, 8, 10 and 12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,156,849 to Moriyama et al. in view of JP 61-171737 to Hiramatsu et al.

Claims 5 and 6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Moriyama et al. in view of Hiramatsu et al. and U.S. Patent No. 3,989,665 to Hollingshead.

The Examiner has relied upon Moriyama et al as disclosing:

...an acrylic elastomer composition, which comprises an acrylic elastomer obtained by copolymerization with 0.1 to 10% by weight of fumaric acid mono-lower alkyl ester on the basis of total monomer mixture and an aromatic diamine compound vulcanizing agent. It is effectively applicable as a vulcanization molding material for seal members or hose members (abstract). Fumaric acid mono-lower alkyl ester-containing acrylic elastomer can be further copolymerized with other vinyl or olefinic monomer (column 3, lines 9-11). The aromatic diamine compound can be used in an amount of about 0.1 to about 5 parts by weight per 100 parts by weight of the fumaric acid mono-lower alkyl ester-containing acrylic elastomer (column 3, lines 52-56). The acrylic elastomer can be further admixed with a reinforcing agent, a filler, an antioxidant etc, if necessary (column 4, lines 17-21). Its vulcanization molding can be carried out by compression molding, injection molding, transfer molding etc (column 4, lines 28-29).

The Examiner concedes that "Moriyama et al is silent with respect to thiazole-based compound; amount of thiazole based compound; and the wall thickness of molded-article, such as gasket or o-ring, of not more than 30 mm.

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The Examiner has accordingly relied upon Hiramatsu et al. as teaching:

... subjecting elastomer to crosslinking with S or S-containing compounds. The sulfur containing compounds include thiazoles such as mercaptobenzothiazole or dibenzothiazyl disulfide. The crosslinked material obtained has low permanent compressive strain and high heat resistance while maintaining excellent workability and moldability characteristic of S-crosslinked material (abstract).

U.S. Patent No. 6,156,349 to Moriyama et al. corresponds to JP 09-273496.

As the Examiner concedes, Moriyama et al. fails to teach the use of a thiazole-based compound.

As evidenced in applicants' specification from a comparison between Example 1 to Comparative Example 1 and between Example 8 to Comparative Example 2, the compression set of a test piece O-ring having a 5 mm wire diameter cannot be improved without a thiazole-based compound.

Thus, Moriyama et al. alone does not teach or suggest applicants' claimed invention.

Hiramatsu et al. (See partial translation previously submitted as Exhibit A) includes a general description about the use of thiazoles such as 2-mercapto benzothiazole in Examples 1 and 2 as well as a description about active chlorine-containing acrylic rubber as an example of a crosslinkable elastomer.

However, Hiramatsu et al. fails to teach a carboxyl group-containing acrylic elastomer. In this regard, it is noted that elastomers used in the Examples are only hydrogenated acrylonitrile butadiene rubber, ethylene-propylene-diene terpolymer rubber and active chlorine-containing acrylic rubber.

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The Examiner has taken the position that it would have been obvious to add thiazoles to the acrylic elastomer composition of Moriyama et al. to obtain low permanent compressive strain and high heat resistance while maintaining excellent workability and moldability characteristics.

However, a comparison between Comparative Example 1 and Comparative Example 2 and between Comparative Example 3 and Comparative Example 4 of Hiramatsu et al. reveals that the compressive sets of Comparative Example 1 and Comparative Example 3 using 2-mercaptobenzothiazole is inferior to those of Comparative Example 2 and Comparative Example 4 in which no 2-mercaptobenzothiazole is used.

This teaching leads to the conclusion that the addition of thiazoles will deteriorate the compression set characteristics.

Thus, the prior art of record provides these teachings:

- 1) Moriyama et al. - fails to teach the use of a thiazole-based compound; and
- 2) Hiramatsu et al. - provides comparative examples that demonstrate that the addition of thiazoles will deteriorate the compression set characteristics.

Thus, applicants' use of including thiazole-based compounds in acrylic elastomer compositions to improve compression set characteristics is clearly and completely unexpected over the prior art or record.

It is therefore clear that the combination of Moriyama et al. and Hiramatsu et al. do not render applicants' claimed invention obvious within the patent statutes.

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The Examiner has relied upon Hollingshead as teaching substituted phenols which have excellent color characteristics and exhibit unusual and unexpected antioxidant activity (abstract).

The Examiner's further reliance upon Hollingshead does not address or overcome the patentable differences between the combination of Moriyama et al. and Hiramatsu et al. and the present invention.

Based upon the above distinctions between the prior art relied upon by the Examiner and the present invention, and the overall teachings of prior art, properly considered as a whole, it is respectfully submitted that the Examiner cannot rely upon the prior art as required under 35 U.S.C. §103 to establish a prima facie case of obviousness of applicants' claimed invention.

It is, therefore, submitted that any reliance upon prior art would be improper inasmuch as the prior art does not remotely anticipate, teach, suggest or render obvious the present invention.

It is submitted that the claims, as now amended, and the discussion contained herein clearly show that the claimed invention is novel and neither anticipated nor obvious over the teachings of the prior art and the outstanding rejection of the claims should hence be withdrawn.

Therefore, reconsideration and withdrawal of the outstanding rejection of the claims and an early allowance of the claims is believed to be in order.

It is believed that the above represents a complete response to the Official Action and reconsideration is requested.


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If upon consideration of the above, the Examiner should feel that there remain outstanding issues in the present application that could be resolved; the Examiner is invited to contact applicants' patent counsel at the telephone number given below to discuss such issues.

To the extent necessary, a petition for an extension of time under 37 CFR §1.136 is hereby made. Please charge the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 12-2136 and please credit any excess fees to such deposit account.

Respectfully submitted,



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